

STORMS AND WEATHER WARNINGS

WASHINGTON FORECAST DISTRICT

Storm warnings were issued in connection with five disturbances during the month. On the morning of the 1st a disturbance of very slight intensity was centered near the mouth of the Mississippi River and pressure was abnormally high over southern Canada and the greater part of the United States east of the Rocky Mountains. Two p. m. special observations indicated that the disturbance would advance to the Georgia coast and move rapidly northeastward with a marked increase in intensity. Accordingly, northeast storm warnings were ordered displayed at 4:30 p. m. from Beaufort, N. C., to Atlantic City, N. J., and at 10 p. m. northwest warnings were displayed from Jacksonville, Fla., to Savannah, Ga. The following morning the storm center was near Cape Hatteras, where the barometer reading was 29.22 inches, and at 9:30 a. m. northwest storm warnings were ordered north of Savannah to Morehead City, N. C., and northeast warnings north of Atlantic City to Boston, Mass. At 2 p. m. the northeast warnings were extended to Eastport, Me. This storm increased in area and intensity and became quite severe. Maximum wind velocities of 60 miles an hour or more were reported quite generally along the Atlantic coast from Cape Hatteras to Cape Cod, Hatteras reporting 70 miles per hour from the north, and Nantucket and Highland Light, Mass., 72 and 74 miles per hour, respectively, from the northeast. This was by far the most severe storm during March.

The morning of the 8th a disturbance of marked intensity was central over the upper St. Lawrence Valley with a trough extending southward to the North Carolina coast, and northeast storm warnings were displayed at 9:30 a. m. from Cape Hatteras to Boston. Several stations reported maximum velocities in excess of 40 miles per hour, and New York City reported 64 miles per hour from the northwest. The following morning a disturbance of moderate intensity that had developed over northern Mexico was centered over Georgia, moving east-northeastward, and northeast storm warnings were displayed at 11 a. m. from Beaufort, N. C., to the Virginia Capes. This disturbance did not increase in intensity as expected; consequently no winds of gale force occurred.

No further warnings were required until the 24th, when a disturbance of moderate but increasing intensity was advancing northeastward over the ocean between Bermuda and the southern New England coast. At 4:30 p. m. northeast storm warnings were displayed from Block Island, R. I., to Boston. The highest velocity reported on the coast was 52 miles per hour from the northeast at Nantucket. By the time this storm had reached Newfoundland the barometer had fallen to 28.88 inches near its center.

The last warnings of the month were displayed at 6 p. m. of the 26th from Cape Henry to Atlantic City in connection with a secondary disturbance that developed over Maryland and Virginia and advanced eastward over the ocean. It did not increase materially in intensity, however, and no strong winds occurred along the coast.

Small-craft warnings were displayed along the Mississippi, Alabama, and extreme northwest Florida coasts on the 1st and 12th and along portions of the Atlantic coast on the 9th, 23d, 24th, and 25th. A warning of strong northerly winds for the Panama Canal Zone was issued the evening of the 2d.

Few frost warnings were required during the first 20 days of the month and were confined to the South Atlantic and east Gulf States. The most important warnings of the month were those of the 2d and 3d. Killing frost and freezing temperature occurred from Mobile, Ala., eastward to Jacksonville, Fla., on the morning of the 3d, and light to heavy frost as far south as Miami the following morning.

On account of unseasonably warm weather between the 5th and 21st vegetation advanced quite rapidly and frost warnings were required as far north as Kentucky and southern Virginia by the latter date. Frequent warnings were issued during the last 10 days of the month, but no killing frosts were reported.—*C. L. Mitchell.*

CHICAGO FORECAST DISTRICT

Mild temperatures, with only slight interruptions to cooler weather, continued throughout the month in practically the entire forecast district. The excess in temperature was considerable from the Great Lakes westward, record-breaking maxima, for so early in the season, of 76° at Omaha and 68° at Minneapolis being reported on the 15th, and 71° at Chicago on the 16th; and the only deficiency was in the extreme southwest portion of the district.

The weather, otherwise, was not unusual, except for rather heavy precipitation in the lower Ohio, middle Mississippi and lower Missouri Valleys and adjoining sections, resulting in some flood conditions.

The low-pressure areas which crossed the forecast district, almost without exception, came from the far West, and in their passage the centers lay either in the middle or in the northerly portions of the district, with the troughs extending to the south.

Advisory messages were sent to open ports on Lake Michigan, on several occasions, in advance of storm conditions; and an especially strong warning was issued on the night of the 31st, when the weather map showed a marked storm development in the middle Missouri Valley. This storm moved directly eastward, and strong winds occurred within the next 24 to 36 hours over the greater portion of Lake Michigan.

No casualties were reported on the lake during the month and navigation increased over the southern half during the closing days, due to unusual freedom from ice following the protracted mild weather.

Special warnings were sent daily to certain interests, including shippers of apples from the North Pacific States, banana interests and shippers of ink in the Middle West.—*H. J. Cox.*

NEW ORLEANS FORECAST DISTRICT

Moderate weather prevailed over most of the district during March. Cold-wave warnings were issued on the night of the 18th for Oklahoma, northwestern Texas, and northwestern Arkansas, were repeated on the 19th, and were extended on that date over Arkansas, the interior of Texas, and northwestern Louisiana. On the morning of the 20th warnings were extended to the Texas coast. These warnings were verified over most of the territory covered and temperature fell decidedly throughout the district.

Frost or freeze warnings were issued for parts of the district on the 1st, 2d, 3d, 9th, 12th, 17th, 20th, 21st, 22d, and 24th; frost occurred generally in the areas covered, and no frost of any consequence occurred without warnings.

Storm warnings were displayed on parts of the Texas coast and small-craft warnings for the other portions on the 1st, 8th, 11th, and 19th, and small-craft warnings on the 4th, 7th, 10th, 25th, and 31st. Winds occurred which justified the warnings. No general storm occurred without warnings.

"Norther" warnings were issued for United States shipping interests at Tampico, Mexico, on the 1st and 21st.—*I. M. Cline.*

DENVER FORECAST DISTRICT

Viewing the month as a whole, there were marked contrasts in weather conditions over the district. In Montana and northern Wyoming very mild and dry weather prevailed, with mean temperatures from 3° to 8° above normal; in Utah and Colorado, on the other hand, cold and stormy weather predominated, especially in northeastern Colorado, where it was the coldest March since 1909, and where more than double the normal amount of precipitation occurred. In New Mexico and Arizona more settled conditions prevailed, with temperature and precipitation both somewhat below normal. Many lows passed eastward along the Canadian border and a number of active disturbances crossed the central portion of the district. On the evening of the 18th, a low in the southwest and a high on the northeastern Rocky Mountain slope both having increased in intensity, with a sharp fall in temperature over Wyoming and northern Colorado, warning of a moderate cold wave was issued for southern Colorado and repeated for southwestern Colorado on the morning of the 19th. These warnings were fully verified over the regions specified, and the cold wave extended southward over New Mexico. On the evening of the 31st, with a low moving rapidly eastward over Kansas, followed by a sharp temperature fall in southeastern Wyoming and with mild temperature in eastern Colorado, a moderate cold-wave warning was issued for eastern Colorado. This warning was verified in the extreme eastern part of the State. Warnings to the air-mail service of fresh to strong westerly winds were issued for Wyoming on the evening of the 6th, and for Wyoming and northeastern Colorado the evening of the 14th. Frost warnings were issued for southern New Mexico on the 29th and 31st; temperatures low enough for the formation of frost occurred in the latter instance.—*E. B. Gittings.*

SAN FRANCISCO FORECAST DISTRICT

Unlike February, when the area of high barometer normally found central off the California coast was feeble or wholly absent and cyclones moved onto the coast in low latitudes, the month of March passed with this area of high barometric pressure fully organized and persistent, and consequently the types of cyclones and anticyclones experienced over the far Western States were radically different from those of the preceding month. As is usual when the anticyclone off the California coast is fully organized, the rainfall over California is deficient, and March proved no exception to this rule. Another striking feature of the pressure distribution over the western North American Continent and the northeast Pacific Ocean was the persistent high barometric pressure with cold weather, the coldest of the winter, over the Bering Sea and the equal persistence of low barometric pressure over the Gulf of Alaska, whence cyclones on many days passed eastward or southeastward onto the continent, and thus frequently caused the formation of

secondary cyclones over the intermountain region. As a result of the influences of these more or less persistent types of pressure distribution, the month passed without excessive rains in any part of the district, but with frequent occasions demanding the issue of warnings of frosts and freezing temperatures, except on the immediate coast. Storm warnings were rarely required and then only for the Washington and Oregon coasts and the inland waters of Washington.

After the 27th, the area of high barometric pressure off the California coast disappeared, and this disappearance was followed by general rains over California during the closing days of the month.

In addition to the general forecasts and warnings and the special forecasts for orchard heating, the district center issued regularly during the month flying-weather forecasts for the commercial airways of the district.—*E. H. Bowie.*

RIVERS AND FLOODS

By H. C. FRANKENFIELD

As the great flood in the Mississippi River and many of its tributaries continued at the end of the month, report thereon will be postponed until the end of the flood in the extreme lower river, which will probably be about the end of May.

Atlantic drainage.—Melting snows from high temperatures accompanied by moderate rains resulted in ordinary flood stages in the Connecticut River and in the Susquehanna River and tributaries in the State of New York about the middle of the month. The usual warnings were issued and the damages were small, virtually none in New England and about \$5,000 in New York. Savings in New York through the warnings were about \$10,000. There were also moderate floods in the rivers of the Carolinas between March 8 and 15 for which the usual warnings were issued. The damage was nominal.

East Gulf drainage.—There was a flood of substantial proportions in the Tombigbee River of Alabama and Mississippi, and in the Black Warrior River of Alabama, following the heavy rains of March 7, 8, and 13. Warnings were issued on March 9 and supplemented on March 13 and 14. At Demopolis, Ala., the crest in the Tombigbee River was 51.8 feet, 12.8 feet above the flood stage, on March 20, and the river was above the flood stage from March 10 to 29, inclusive. As movable property had been taken away preceding the high floods of January and February, the losses were very small, only about \$4,900, while the reported value of property saved through the warnings was \$24,925.

The rivers of the Pascagoula system were also in moderate flood about the middle of March. Warnings were issued and there was no damage of consequence. Pearl River, of Mississippi and Louisiana, was also in flood much of the month, especially at Jackson, Miss., but again there was no loss except as occasioned by suspension of business.

Great Lakes drainage.—Rains from March 18 to 21 caused moderate floods in the rivers of the Lake Erie drainage, but there was only some slight damage from overflow and seepage. Warnings were issued at the proper time.

Mississippi drainage—Ohio Basin.—The quite heavy rains during the third week of March resulted in floods throughout the Ohio River below Louisville, Ky., and in all its tributaries. They were not severe except in the Wabash system, in the Green River of Kentucky, and